16 FEB 1979

MEMORANDUM FOR: Deputy Director for Administration

FROM: James H. McDonald
Director of Logistics

SUBJECT: Environmentally Sensitive Equipment
Areas within the Headquarters Building

1. This memorandum, in response to a tasking by the DDA, reviews the growth of special-use and environmentally sensitive equipment (ESE) areas in the Headquarters Building. The memorandum identifies the requirements for ESE when the building was constructed and tracks subsequent growth. The locations and size of ESE areas initially and as of this date are included as Figures 1a through 1h. The memorandum discusses the challenges and constraints in retrofitting the building to provide both the utilities, reliability, and the environmental support required by the growth of ESE areas. Utility systems now serving the ESE areas are discussed. The expansion of ESE areas and utility systems presently underway are identified along with future plans that require utility or space increases. A list of abbreviations and definitions is attached for your convenience.

2. The overcrowding of the Headquarters Building along with the questionable practicality of the continuing adaptation of Headquarters office space for special-purpose functions has been extensively discussed in a multitude of previous reports and correspondence. The purpose of this paper is to indicate the growth of the special-purpose areas and to discuss their attendant requirements for stable and reliable utilities systems.

3. The location, area, and occupancy of the environmentally sensitive equipment (ESE) spaces that were designed into the building at the time of occupancy are shown in yellow on Figures 1a through 1h. The present location, area, and occupancy of ESE spaces are indicated in red on the same figures.

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4. By way of background, at the time of conceptual design of the Headquarters Building in the mid-1950's, the Agency made little significant use of electronic data processing (EDP) equipment, and the scope and character of today's use was certainly not envisioned. As shown in Figures 1a through 1h, the building was designed for a number of special-use areas, most notably the RID (now ISD) computer area, the Signal Center, and the CRS (now OCR) minicard area; yet other than the Walnut and minicard areas, none of the areas had systems designed for particularly sensitive environment control. Also impacting on facility design criteria of the period was the fact that EDP equipment available on the market at that time was relatively stable and tolerant of wide variations of power, temperature, and humidity. A number of interrelated (and continuing) trends led to the current ESE facilities requirements of today, such as the following:

a. EDP equipment capabilities have increased substantially per pound of hardware and per unit of power.

b. The demand for EDP products and utilization of related ESE have increased far more radically than equipment capabilities per unit of space (resulting in increased space demands).

c. With increased EDP sophistication and the evolution to microcircuitry, facilities engineers have been forced to devise "clean-room" systems and to control power, temperature, humidity, and air systems to closer tolerances. EDP equipment designers both encouraged and relied upon these environmental improvements not only to permit design of yet more sophisticated systems, but also to reduce design, manufacture, and operating costs.

d. With the greatly increased and concentrated costs of ESE plus increased hazards to personnel from fire and electrical shock, safety engineers sharply increased the scope, capability, and complexity of protection and detection systems.

e. Concurrently, with the preceding equipment trends, the Agency converted many manual or ADP systems to EDP (such as cable dissemination, transmission, relay, and receipt; CRS data banks; payrolling; etc.). The Agency also entered into sophisticated collection, analysis, and R&D programs related to SIGINT and imagery targets which created the most significant requirement for EDP and other environmentally sensitive equipment, while ODP concurrently decentralized their computer capability to components through the Delta Data terminals and user-oriented programming packages. This decentralization has, in essence, given the customer a dedicated computer center, through time sharing of ODP's resources, and has significantly increased the demand for EDP services.

f. The simultaneous and indirectly related trend toward greater use of electrical office equipment (typewriters, Xerox-type copiers, calculators, etc.), plus greater concern for employee comfort, expanded demands on existing power and air-conditioning systems.

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construction and humidity control only in the small Walnut area for the RID original computer system; and no other specific provision was made for humidity, dust control, ESE safety devices, and reliable, transient-free power.

6. As ESE use expanded, areas (primarily on the ground and first floors) were converted to house this equipment. The house power system, with some modification, met most of the expanded requirements for primary power; however, the house air-conditioning system was not so flexible and many special package units were installed to provide primary, supplemental, and/or backup air conditioning. (Virtually all of the power utilized by ESE is converted directly to heat; therefore, air-conditioning requirements represent an almost direct energy conversion of connected power load.) Figure 2 indicates the location and area of these utility systems that are located in the Headquarters Building as they now exist. The Trane system was installed to air condition the original OCS (now ODP) computer area (and is now too small to handle the total load), the ACME system was installed when the Signal Center [redacted] was provided, and numerous smaller package systems were provided for areas such as the sixth floor Datacom and the AND/OEL (now OSO) equipment area. With major expansion of the RID (ISD) and OCS computer rooms, the Carrier package system was installed, and the 2500 kW "critical" power generator project initiated to provide rapid response backup power for essential ESE areas. The construction in 1974 of the CRS (now OCR) computer center imposed further increased loads on these power and air-conditioning systems. As all of the areas expanded, in some areas the floor-to-ceiling height restricted the allowable height of elevated floors, thereby making below-floor cable tray, conduit, and chilled water distribution piping installation difficult, if not impractical, and imposed severe restrictions on the scope of safety systems that could be installed.

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7. A major event affecting ESE was the power outage of 1970 which provided the impetus for rapid completion of the "critical" backup power system; replacement of the 30 kW instantaneous generator (which had been reduced to manual operation because of maintenance problems) with a 250 kW, quick-response, automatic generator entitled the "frantic" backup power system; initiation of an extensive utilities reliability study by a consultant firm; and establishment of

a Headquarters Engineering Branch (HEB) with a charter to ensure utilities systems reliability. Subsequently, based on HEB recommendations and ESE requirements, a motor generator (MG) set was installed to provide buffered power to OCS, and this system was subsequently replaced with a solid state uninterruptible power system (UPS). The electrical vault serving most ESE equipment was expanded, the Carrier chilled water system capacity was doubled, and MG sets were programmed in FY 1974 for ISD, CRS, and the Signal Center, with the MG sets subsequently replaced by UPS's. During the course of all the expansions, Safety Branch recommendations were made for improved detection/protection systems and many were implemented. Other safety provisions have been delayed pending fund availability and some, e.g., installation of a sprinkler system in the OCS tape vault, delayed because of technical installation problems caused by the building's physical constraints.

8. The environmental and safety systems supporting the ESE areas of Headquarters are marginal by current technical and safety standards. Agency facilities engineers have been forced to allow this situation to develop due to the following mitigating factors:

a. From the date of occupancy, the Headquarters Building has been crowded with no available space for expansion. All ESE areas, therefore, expanded at the expense of other functions or components; a naturally limiting factor inasmuch as significant upgrades of facilities around ongoing ESE operating is difficult and expensive.

b. Sophisticated utility support systems are inherently incompatible with the constraints of the standard office-type building originally constructed. The marginality of the existing building configuration (slab-to-slab heights, column spacing, square foot availability, utility source capacity, and locations) have lead to a perpetuation of adequate but less than ideal solutions to our ESE needs.

c. Planning and programming data for new generation ESE was not available to facilities engineers on a timely basis; therefore, facilities changes were most often made with minimum planning and construction time to meet equipment operational dates.

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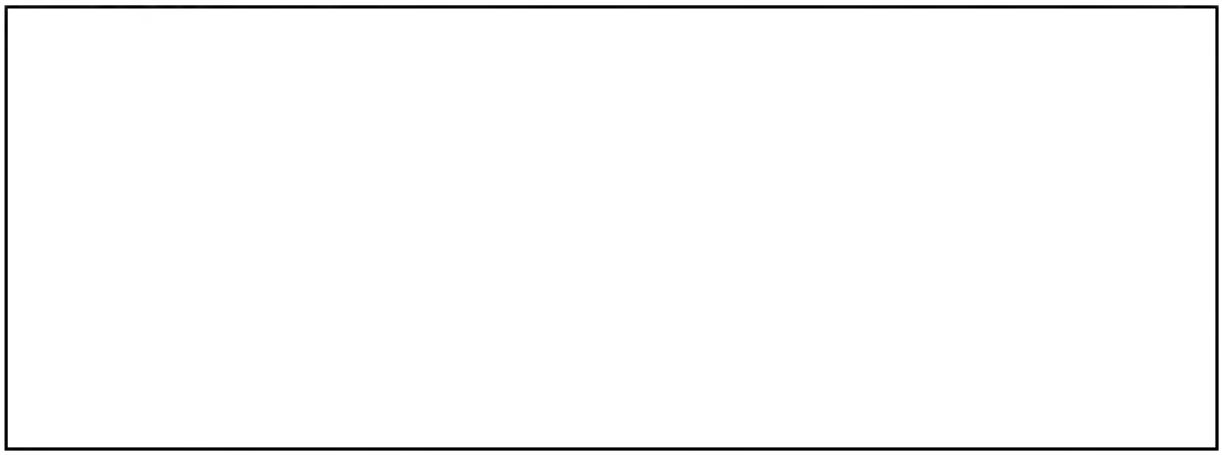
d. Space allocation policy has generally followed a concept of a federation of directorates controlling given blocks of space. Coupled with the "need-to-know" policy, this concept significantly hampered provision of central supporting facilities and utilities for overall ESE and encouraged treating each area as a separate and independent entity.

e. Inasmuch as Headquarters is a relatively new and "monumental-type" structure, low priorities have, in the past, understandably, been placed on major expenditures for facilities improvements (awareness was, however, increased by the major power failure of 1970).

9. Figure 2 supplements Figures 1a through 1h and identifies the locations of the utility systems located in the Headquarters Building that serve each ESE area. The following activities are now funded and work is underway:

a. Convert both of the now manually activated 2,000 kW generators in the powerhouse to automatic start units, thereby reducing their response time and resultant power outage from 20 to 30 minutes to about 90 seconds.



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d. Design and construction of 17,600 square feet of ESE space to house the miniframe computers associated with project SAFE.

e. Design and construction of 3,800 square feet of UPS equipment space to provide buffered power for project SAFE.

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f. Design and construct 2,000 square feet of ESE space and 4,100 square feet of photoprocessing area for Project ADSTAR.

g. Provide and install 400 square feet of new 400 Hz UPS equipment in support of Project CAMS.

10. Upon completion of the above items now in progress, the Headquarters utility environmental systems will serve all future requirements that are now identified with adequate reliability and safety. The physical envelope of the building will preclude additional significant expansion of utility systems in the south quadrant of the building, and the existing systems will be utilized to capacity. A study is underway to increase the power capacity at the north quadrant through the construction of an additional transformer vault. If a new vault is funded and constructed, ESE areas could be incorporated in the north quadrant utilizing the capacity of the new vault. Presumably, the ESE areas would be located on the first floor where the 16' slab-to-slab height (14' for ground floor and from 10' 5" to 11' 9" for floors for 2 through 7) minimizes the difficulty of meeting reliability, safety, and environmental requirements.

11. Representatives of the Real Estate and Construction Division, OL, would welcome an opportunity to escort you on a tour of the utility support systems that serve the ESE areas and to answer any questions you may have on the history of the above utilities systems' development and of future plans for systems changes and growth.

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for James H. McDonald

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ROUTING AND RECORD SHEET

SUBJECT: (Optional)

FROM:	EXTENSION	NO.
Director of Logistics		OL 9 0649
		DATE 16 FEB 1979

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TO (Officer designation, room number, and building)	DATE RECEIVED	DATE FORWARDED	OFFICER'S INITIALS	COMMENTS (Number each comment to show from whom to whom. Draw a line across column after each comment.)
1. Deputy Director for Administration 7D25 Hdqs				Figures 1 and 2 show the location of the Agency's computer, communications, and other equipment areas along with the location of their critical utility support systems. Although each area and utility system was installed through an unclassified contract, the consolidated identification of all areas and systems is considered sensitive. It is recommended that Figures 1 and 2 be carefully controlled or separated from the memo and destroyed.
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